

## **Implicit Climate Change Adaption: Modifying System Operations for Turbidity Control**

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### **Abstract**

The water supply system operated by the New York City Department of Environmental Protection (NYCDEP) delivers roughly 1.2 billion gallons of water daily to nearly half the population of New York State. About 90% of the supply is provided by the Catskill/Delaware System located west of the Hudson River. In 2007 the United States Environmental Protection Agency (U.S. EPA) granted a new waiver to filtration for the Catskill/Delaware System through 2017.

One of the biggest challenges to maintaining filtration avoidance long term is controlling source water turbidity. Elevated turbidity is of concern primarily due to its potential impact on the disinfection process. Turbidity in the Catskill System's terminal reservoir, Ashokan Reservoir, is typically less than 5 NTU. However, periodic storm events erode naturally occurring silt and clay deposits in stream banks and channels in the Schoharie and Ashokan watersheds, which can lead to elevated turbidity levels in the water supply system. Increased precipitation and more frequent intense precipitation events are suggested for the northeastern United States by Global Climate Models (GCM) under a variety of different emission scenarios considered by the Intergovernmental Panel on Climate Change (IPCC). Higher precipitation and more intense storm events could exasperate turbidity impacts on the Ashokan and Schoharie watersheds.

In order to address the issue of source water turbidity, NYCDEP advanced a series of three studies to understand the source of turbidity in the Catskill System and to develop structural and non-structural strategies to prevent, manage and control turbidity. The study work was completed through the development of linking a water supply system mass-balance model (OASIS) and a reservoir water quality model (W2). This combined model was used to test structural and non-structural alternatives for turbidity control.

The studies concluded that non-structural system operational changes can significantly improve the Ashokan Reservoir and distribution intake water quality. The studies further concluded that the development and implementation of a real-time system Operational Support Tool (OST) that combines water quality and water supply data with forecast inputs along with the construction of selected infrastructure improvements is the most cost effective means to achieve turbidity control. In addition to the water supply benefits, the implementation of OST will provide a better understanding of water supply risks associated with operational changes. Although the advancement of OST was not done explicitly to address climate change, it will allow NYCDEP to react to changing conditions in real time and possibly provide benefits in three areas that may be impacted by climate change- system water quality, downstream flood events, and cold water fisheries habitats.

Water utilities must be prepared to address potential changes from both climate change and anthropogenic influences and continue to meet consumer needs and address stakeholder expectations. The development of complex analytical tools will help meet these challenges. The implementation of OST is one way that NYC is meeting these challenges. However, important research needs remain both in the scientific and legal community to better support the adaptation of water utilities to the challenges of climate change.